

Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) A catheter tip apparatus ~~arranged in a catheter for the delivery and collection of an energy signal to permit subsequent light energy beam analysis of body tissue by the collected signal~~, comprising:

an elongated housing rotatably supported on a flexible catheter sheath, said housing supporting ~~a first reflective surface~~ and a second reflective surfaces, said first reflective surface and ~~said second reflective surfaces~~ being longitudinally spaced apart from one another;

a ~~first flexible, elongated energy bearing~~ delivery fiber having a distal~~most~~ end arranged adjacent to said first reflective surface; and

a ~~second flexible, elongated energy bearing~~ collection fiber having a distal~~most~~ end arranged adjacent to said second reflective surface; ~~[[and]]~~

~~said housing rotatably supported on a flexible catheter sheath for insertion of said catheter into a mammalian body for tissue analysis thereof.~~

2. (Original) The catheter tip apparatus as recited in claim 1, wherein said housing comprises a frame member having a slot arranged therein for receipt and alignment of said first and said second reflective surfaces.

3. (Original) The catheter tip apparatus as recited in claim 1, wherein said first reflective surface and said second reflective surface each comprise a beam redirecting member.

4. (Currently Amended) The catheter tip apparatus as recited in claim 2, wherein said slot comprises ~~has shoulders therein to guideably secure and accurately align~~ said reflective surfaces therein.
5. (Currently Amended) The catheter tip apparatus as recited in claim 2, wherein said housing comprises ~~has~~ a proximal ~~most~~ stem portion for receipt into a catheter sheath to permit manipulation of said tip from a proximal location.
6. (Currently Amended) The catheter tip apparatus as recited in claim 1, wherein said housing comprises a frame member having a proximal end and a distal end, with an upstanding proximal block and an upstanding midblock, each block having an adjacent ~~a~~ pocket ~~thereadjacent~~ for receipt of a reflective surface attachable therein.
7. (Original) The catheter tip apparatus as recited in claim 6, wherein said reflective surface comprises a mirror glued into said pocket.
8. (Currently Amended) The catheter tip apparatus as recited in claim 6, wherein each of said upstanding blocks has a bore therethrough for receipt of one of said ~~energy bearing~~ fibers.
9. (Currently Amended) The catheter tip apparatus as recited in claim 1, wherein said housing comprises an elongated generally cylindrically shaped frame member with a proximal end and a distal end, said frame member having at least two steps thereon of decreasing thickness in the distal direction, each of said steps having a reflective surface mounted thereon, said proximal end having a stem portion of reduced diameter<sup>[[5]]</sup> to permit rotative receipt within a catheter sheath.
10. (Original) The catheter tip apparatus as recited in claim 9, wherein said frame member has a cover member arranged to mate over said steps and said reflective surfaces.

11. (Currently Amended) The catheter tip apparatus as recited in claim 10, wherein said cover member has an axially arranged slot thereon through part of its longitudinal length, said slot being disposed radially adjacent to each of said reflective surfaces to permit delivery and reflected collection of an energy beam therethrough.

12. (Currently Amended) The catheter tip apparatus as recited in claim 9, wherein said stem portion is secured to a multi-layered, elongated coil spring arrangement to permit twisting control of said catheter tip ~~within a mammalian body component~~.

13. (Currently Amended) The catheter tip apparatus as recited in claim 1, wherein said reflective surfaces are integral with ~~[unitary portions of]~~ said housing.

14. (Currently Amended) The catheter tip apparatus as recited in claim 13 wherein said housing has a proximal end and a distal end, and said proximal end mates with a housing enclosure, said housing enclosure ~~providing a securement means for securing said energy collecting~~ collection fiber and said housing ~~provides a securement means for securing said~~ delivery fiber.

15. (Currently Amended) The catheter tip apparatus as recited in claim 14, wherein said housing enclosure ~~[attached to said proximal end of said housing]~~ has a longitudinally directed elongated slot therein, said slot being in radial alignment with said reflective surfaces formed on said housing to permit transmission and collection of radiant energy via said respective reflective surfaces to a computerized analysis system.

16. (Original) The catheter tip apparatus as recited in claim 1, wherein said housing comprises a cylindrically shaped member having said first and second reflective surfaces

machined thereon, and wherein said first and second reflective surfaces are non-parallel with respect to one another.

17. (Currently Amended) The catheter tip apparatus as recited in claim 16, wherein said delivery and collection ~~first and second~~ fibers are disposed symmetrically ~~diametrically~~ ~~oppositely aligned with respect to one another~~ about a longitudinal axis of rotation of said housing, to minimize eccentricity of rotation of said catheter housing during rotation of said housing ~~in a body tissue~~.

18. (Currently Amended) The catheter tip apparatus as recited in claim 1, wherein said housing includes a bendable reflective surface ~~which is bendable to effect directional change of an energy beam reflecting therefrom~~.

19. (Original) The catheter tip apparatus as recited in claim 18, wherein said housing has accumulation components defining a fiber alignment slot for miniaturization of said tip.

20. (Currently Amended) A catheter tip apparatus ~~arranged in a catheter for the delivery and collection of an energy signal to permit subsequent computerized analysis of body tissue by the collected signal~~, comprising:

an elongated housing having a longitudinal axis of rotation, said housing having a first reflective surface disposed thereon;

a second reflective surface disposed on said housing distally to ~~of~~ said first reflective surface and in axial alignment therewith; ~~and~~

a ~~first light conductive~~ delivery fiber in ~~light-coupled~~ optical communication with said first reflective surface; and

a ~~second light conductive~~ collection fiber in ~~light-coupled~~ optical communication with said second reflective surface,

said ~~first light-conductive delivery fiber in communication~~ being in communication with a controlled analytical-light-generating source and said ~~second light-conductive collection fiber~~ being in communication with a light-collection analysis device.

21. (Currently Amended) The catheter tip apparatus as recited in claim 20, wherein said first reflective surface is ~~dimensionally~~-larger than said second reflective surface.

22. (Currently Amended) The catheter tip apparatus as recited in claim 20, wherein said first reflective surface ~~is~~-comprises a curvilinear portion.

23. (Currently Amended) The catheter tip apparatus as recited in claim 20, wherein said first reflective surface is not[[~~non~~]]-parallel ~~with respect~~ to said second reflective surface.

24. (Currently Amended) The catheter tip apparatus as recited in claim 20, wherein at least one of said first and second reflective surfaces are spaced apart from said ~~light-conductive~~-fibers.

25. (Currently Amended) The catheter tip apparatus as recited in claim 20, wherein said first reflective surface is disposed radially within and spaced from the perimeter of said housing to permit a spreading of a light beam from said first reflective surface ~~onto said body tissue~~.

26. (Currently Amended) The catheter tip apparatus as recited in claim 24, [~~having~~] further comprising an index matching fluid arranged between a distal end of at least one of said ~~conductive-fibers and said~~ at least one of said reflective surfaces.

27. (Currently Amended) The catheter tip apparatus as recited in claim 24, wherein at least one of said reflective surfaces is positioned in a holding pocket arranged in said housing.

28. (Currently Amended) The catheter tip apparatus as recited in claim 27, wherein said reflective surface comprises a ~~mirrored member~~mirror.

29. (Currently Amended) The catheter tip apparatus as recited in claim 27, wherein said holding pocket ~~is utilized to aligns~~ said reflective surface with ~~respect to~~ said housing.

30. (Currently Amended) The catheter tip apparatus as recited in claim 20, wherein said ~~conductive light~~ fibers are each ~~individually~~ arranged within a bore disposed within said housing.

31. (Currently Amended) The catheter tip apparatus as recited in claim 20, wherein said ~~light delivery~~ fibers are equally diametrically opposed about said axis of rotation of said housing ~~to provide balance thereto and minimize eccentricity during rotation thereof.~~

32. (Currently Amended) The catheter tip apparatus as recited in claim 20, wherein said first reflective surface and said second reflective surface are disposed at an angle proportional to the numerical aperture of said first and second fibers ~~[[;]]~~ to yield a light beam with adjacent edges that are parallel to one another, ~~to permit a distance independent delivery reflector collector reflector separation.~~

33. (Currently Amended) A catheter tip apparatus ~~arranged in a catheter for the delivery and collection of an energy signal to permit subsequent computerized analysis of body tissue by the collected signal,~~ comprising:

an optically-transparent sheath-enclosed elongated housing having a longitudinal axis of rotation, said housing having a first reflective surface disposed thereon;

a second reflective surface disposed on said housing ~~distally of~~to said first reflective surface and in axial alignment therewith;

a ~~first light conductive~~ delivery fiber in ~~light coupled~~ optical communication with said first reflective surface;

~~and a second light conductive collection fiber in light coupled optical communication~~  
with said second reflective surface,

said ~~first light conductive delivery fiber in communication~~ being in communication with  
a controlled analytical-light generating source and said ~~second light conductive collection fiber~~  
being in communication with a light-collection analysis device; and

a generally curvilinear cover arranged to mate over a distal portion of said housing to  
enclose said reflective surfaces, said cover having at least one opening on an annular surface  
thereof to permit ~~light delivery to said body tissue, and to permit passage up light collection~~  
~~therethrough upon reflection from said body tissue.~~

34. (Currently Amended) The catheter tip apparatus as recited in claim 33, wherein at least  
one of said reflective surfaces comprises a ~~mirrored member~~.

35. (Currently Amended) The catheter tip apparatus as recited in claim 34, wherein each of  
said ~~light conductive~~ fibers has a distal end arranged within said housing, and said at least one of  
said ~~light conductive~~ fibers is ~~in an abutting relationship with~~ abuts a non-reflective surface of said  
~~mirrored member~~.

36. (Original) The catheter tip apparatus as recited in claim 33, wherein at least one of said  
reflective surfaces is disposed in a holding pocket.

37. (Currently Amended) The catheter tip apparatus as recited in claim 36, wherein said  
reflective surface disposed in said holding pocket is secured in said holding pocket by an  
adhesive.

38. (Currently Amended) The catheter tip apparatus as recited in claim 33, wherein an index  
matching fluid is disposed about said reflective surfaces ~~to minimize back reflections thereto,~~  
~~from said outer sheath.~~

39. (Currently Amended) A catheter tip apparatus arranged in a catheter for the delivery and collection of an energy signal to permit subsequent computerized analysis of body tissue by the collected signal, the apparatus comprising:

an optically-transparent sheath-enclosed elongated housing having a longitudinal axis of rotation, said housing having a ~~first reflective light delivery surface~~ reflector disposed thereon;

a first ~~reflective light collection surface~~ reflector disposed on said housing distally ~~of to~~ said first ~~reflective light delivery surface~~ reflector and in axial alignment therewith;

a ~~first light conductive delivery fiber in light coupled optical~~ communication with said ~~first reflective light delivery reflector surface~~ and a ~~second light conductive collection fiber in light coupled optical~~ communication with said first ~~reflective light collection reflectorsurface~~, said ~~first light conductive delivery fiber in~~ being in communication with a controlled analytical-light generating source and said ~~second light conductive collection fiber~~ being in communication with a light-collection analysis device; and

a second ~~reflective light collection reflectorsurface~~ disposed on said housing distally ~~of to~~ said first ~~reflective light collection reflector~~, said second ~~reflective collection reflectorsurface~~ also being in communication with said controlled analytical-light generating source and in axial alignment therewith; ~~said first and second reflective surfaces arranged to permit deep tissue light energy penetration and collection and analysis thereby.~~

40. (Currently Amended) The catheter tip apparatus as recited in claim 39, wherein said first and second ~~light collection reflectors are disposed to~~ surfaces collect light emitted from a common light delivery source.

41. (Currently Amended) A method of detecting a structure beneath a wall of a body lumen, ~~delivering and collecting a tissue striking light energy signal from a first light bearing member and adjacent delivery beam redirecting member and returning said light energy signal to a~~



~~collection beam redirecting member adjacent a second light bearing member for analysis and tissue treatment, in a light bearing arrangement, including the method comprising:~~

~~displacing ~~displacing~~ said collection beam ~~redirector~~ redirecting member distally of said and a delivery beam redirector member along a longitudinal axis of in a sheath-enclosed elongated catheter housing tip, said housing having a longitudinal axis; and~~

~~disposing said beam redirectorsing members at an angle with respect to said longitudinal axis, of said elongated housing the angle being proportional to a numerical apertures of said first and second energy fibers.~~

42. (Currently Amended) The method as recited in claim 41, further comprising~~including~~:  
bathing said ~~reflectors~~redirectors in an index matching fluid to minimize back reflection in said sheath-enclosed housing.

43. (Currently Amended) The method as recited in claim 41, further comprising~~including~~:  
disposing said redirectors such that fields-of-view associated with the redirectorsdirecting  
~~said delivery light energy signal and said collection light energy signal so as to yield adjacent parallel edges thereof that are parallel.~~

44. (Canceled)

45. (Currently Amended) The method as recited in claim 41, further comprising  
selecting~~wherein~~ said numerical apertures ~~for each of said beam redirectors are to be~~ different from one another.

46. (Currently Amended) The method as recited in claim 41, further comprising selecting  
~~wherein~~ said beam redirectors ~~are to be~~ reflectors.

47. (Currently Amended) The method as recited in claim 41, further comprising providing wherein said beam bearing members comprise optical fibers in optical communication with said redirectors.

48. (Currently Amended) The method as recited in claim 41, further comprising providing wherein said beam bearing members comprise waveguides in optical communication with said redirectors.